



Oh, that explains it



Michigan Merit Curriculum High School Graduation Requirements

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COURSE/CREDIT CONTENT EXPECTATIONS

The Michigan Department of Education has developed and the State Board of Education has approved *High School Content Expectations (HSCE)* that outline what students should know and be able to do in English language arts, mathematics and science. Content Expectations for social studies are currently in the development process. These expectations serve as the foundation for the development of more specific Course/Credit Content Expectations that outline what students should know and be able to do for each credit required in the Michigan Merit Curriculum.

The Michigan Merit Curriculum Course/Credit Content Expectations and Guidelines will assist school districts and teachers to align their current curriculum, guide what is taught and assessed to earn credit, and provide parents with a tool to gauge student progress. These expectations also will serve as the basis to develop various questions included in the Michigan Merit Exam.

In the future, the Michigan Department of Education will be developing a variety of companion documents to support the implementation of these credits.

SCIENCE

What the Michigan Merit Curriculum Law Says

Sec. 1278b(1)(b) The board of a school district or board of directors of a public school academy shall not award a high school diploma to a pupil unless the pupil has successfully completed at least 3 credits in science that are aligned with subject area content expectations developed by the Michigan Department of Education and approved by the Michigan State Board of Education, including completion of at least biology and either chemistry or physics. The law strongly encourages pupils to complete a 4th credit in science, such as Forensics, Astronomy, Earth Science, Agricultural Science, Environmental Science, Geology, Physics or Chemistry, Physiology, or Microbiology.

Sec. 1278b(5)(f) The science credit requirements are not subject to modification as part of a personal curriculum.

Background Information

The Science High School Content Expectations (HSCE) were designed to include essential general science understandings as well as discipline-specific descriptions for Earth Science, Biology, Physics, and Chemistry. The HSCE are organized in four disciplines/strands, 19 standards, 92 content statements, and prerequisite, essential, core, and recommended content expectations. Students are expected to meet all essential expectations (those describing essential general science knowledge and skills and assessable on the Michigan Merit Exam) by the end of high school. The overarching goal for the Science HSCE is for students to engage in the four Practices of Science Literacy listed in the Successful Post-Secondary Engagement chart on page 3 of the HSCE document available on the Michigan Department of Education's high school web site at www.michigan.gov/highschool. These practices are developed throughout the four years of high school science instruction by building, refining, applying, and extending the useful and connected knowledge, skills, and strategies incorporated in the standards and expectations.

Course/Credit requirements have been developed for Earth Science, Biology, Physics, and Chemistry. They define the expectations that must be met for high school credit in Earth Science, Biology, Physics, or Chemistry. All students are required to earn three science credits aligned with the HSCE. These three credits must include Biology and either Chemistry or Physics. The 3rd science credit may be met by taking another science course designed to meet other expectations included in the HSCE. The Michigan-developed science component of the high school Michigan Merit Exam (MME) will be based on the essential expectations from all four disciplines.

Districts are encouraged to offer opportunities for meeting both the graduation requirements and the essential science expectations identified as necessary for science literacy. The graduation requirement legislation recommends, but does not require, a fourth year of science credit.

What Research Says

Research shows students taking courses in Biology, Chemistry, and Physics and upper-level mathematics beyond Algebra II (such as Trigonometry) are more likely to be college ready. However, only 26% of ACT-tested high school graduates in Michigan met ACT's College Readiness Benchmark, demonstrating their readiness for their first credit-bearing college course in Biology.

Most modern technology came from physics. Any technology involving electricity, magnetism, mechanics, heat, light, sound, optics, etc. comes from physics. In addition, Physics is one of the few high school-level classes that requires both high level mathematical and verbal skills. All problems in physics are word problems that require students to think logically, use analogies, and deal with subtle shades of meaning as well as use mathematics. Physics courses teach students to think, a valuable skill apart from the knowledge content of physics.

In Michigan, approximately 40 percent of students took chemistry and 25 percent took physics prior to high school graduation.

Questions & Answers

1. **Q: What was the thinking behind the choice of science courses listed in the Michigan Merit Curriculum?**

A: Students are required to take a minimum of three credits of science: Biology, Physics or Chemistry, and one additional science credit aligned the HSCE, such as Earth Science. These courses are specified because they are most often the prerequisite courses for additional study in science, mathematics, or engineering. However, these recommendations do not specify a sequence, nor do they represent the only courses that could meet the requirement. The law strongly encourages students to take a 4th science credit such as Forensics, Astronomy, Earth Science, Agricultural or Environmental Science, Geology, Physiology, Microbiology, etc.

2. **Q: What subject can a student take to fulfill the 3rd science credit required in the Michigan Merit Curriculum?
Can Advanced Placement (AP) Environmental Science be counted as a "science" under the new state curriculum?**

A: Under the Michigan Merit Curriculum, students are required to take three credits of science including Biology, Chemistry or Physics and one additional credit aligned with the HSCE. Students may select the 3rd credit from the menu of science credits offered and approved for credit by each district. These offerings could include AP courses. Since the MME will assess the essential expectations in all four science disciplines, districts should offer opportunities to meet all essential expectations.

3. **Q: With respect to Physics and Chemistry classes, will a basic level of those classes be acceptable or will students have to take the more rigorous classes that require higher-level mathematics?**

A: The Course/Credit Requirements for assigning credit for Physics and for Chemistry include meeting all essential and core expectations. Students earn the required credit for Chemistry or Physics when they have met the course/credit expectations. The law states that the assignment of credit must be based, at least in part, on assessments designed for the purpose of determining whether the expectations have been met. Since students are required to earn four credits in mathematics, they should be prepared for the mathematics infused in the science credits.

4. **Q: Can students earn science credit for conceptual Physics and Chemistry classes, or for other classes designed to address science concepts at a basic level?**

A: The law does provide districts with the flexibility to determine which classes or credits contain enough science that is aligned with the HSCE to count as the 3rd science credit. Therefore, a district could decide to grant students their 3rd science credit for Basic Chemistry, Conceptual Physics, or for Physical Science, but students still would be required to earn a full credit for either Physics or Chemistry.

5. **Q: Can a student take a Physics class and count it for both a math/math-related and physics credit?**

A: No. If a student takes Physics as one of three required science credits, it could not be counted as a math-related credit. However, if a student takes Physics as an elective after fulfilling his/her science requirements, it could qualify as a math-related class as determined by the district.

6. **Q: Would an Earth Science class need to include the entire essential and core expectations for Earth Science. In other words, once a class is deemed Earth Science must it then meet ALL the expectations for that course?**

A: If a course is designed to provide students with a high school Earth Science credit, it must meet all course/credit content expectations.

Earth Science is not a required science credit, but it could be used as a 3rd year science credit. A course should only be named Earth Science if it designed to meet all of the Earth Science course/credit content expectations. If a student takes a general science or other course designed to meet some of the Earth Science expectations, that course could count as a 3rd science credit if it is aligned with the HSCE, as determined by the district.

7. **Q: While Earth Science is not a required credit under the Michigan Merit Curriculum, will it be tested on the new Michigan Merit Exam (MME)?**

A: While Earth Science is not a high school graduation requirement, the essential skills listed for Earth Science are expectations for high school and will be tested on the MME, along with the essentials for the other three science credit areas.